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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,682	03/31/2004	Wen Lin	LIN 13-38	8308
47396	7590	12/18/2007	EXAMINER	
HITT GAINES, PC			MALDONADO, JULIO J	
LSI Corporation				
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RICHARDSON, TX 75083			PAPER NUMBER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@hittgaines.com

Office Action Summary

Application No.

10/814,682

Applicant(s)

LIN ET AL.

Examiner

Julio J. Maldonado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 31 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 41-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 41-53 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The cancellation of claims 1-40 and the addition of claims 41-53 as set forth in the reply filed on 10/31/2007 are acknowledged.
2. Claims 41-53 are pending in the application.

Continued Examination Under 37 CFR 1.114

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/31/2007 has been entered.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 41 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. In reference to claim 41, the applicants recite, "...wherein said source/drain regions do not extend into said co-doped germanium buried layer.". However, this was not described in the specification.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 41-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bevk et al., (U.S. 5,500,391, hereinafter Bevk) in view of Liaw et al. (U.S. 5,891,769, hereinafter Liaw).

In reference to claim 41, Bevk (Fig.6) teaches a CMOS device including a germanium buried layer (20) located over a doped substrate (10), wherein a middle portion of said buried layer (20) is labeled co-doped germanium buried layer; and a doped epitaxial layer (30) located over said co-doped germanium buried layer (20) (Bevk, column 2, line 45 – column 4, line 19).

Bevk fails to expressly disclose a gate structure, wherein said gate structure including a gate dielectric gate electrode, and source and drain regions. However, this is inherent in Bevk since Bevk is directed to the formation of a CMOS structure. Accordingly Bevk teaches upon the recited limitation.

Still Bevk fails to disclose wherein said source/drain regions do not extend into said co-doped germanium buried layer.

However, Liaw (Figs.1 and 4) teaches a field effect transistor device including a substrate (Fig.1, '11' and Fig.4, '51'); a buried layer (Fig.1, '12' and Fig.4, '53') on said substrate (Fig.1, '11' and Fig.4, '51'); an epitaxial layer (Fig.1, '19' and Fig.4, '54') on

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said buried layer (Fig.1, '12' and Fig.4, '53'); a gate structure (Fig.1, '22', Fig.4, '58') and source/drain regions (Fig.1, '16', '17', Fig.4, '56', '57'), wherein in one embodiment of the invention (Fig.1) the source/drain regions extends into said buried layer, wherein in a second embodiment of the invention (Fig.4) the source/drain regions does not extend into the buried layer, and wherein said buried layer (Fig.1, '12' and Fig.4, '53') is a co-doped germanium layer, SiC, AlN, or the like (Liaw, column 2, lines 36 – 56, column 3, lines 14 – 26, column 5, lines 36 – 50 and column 6, lines 17 – 39).

Furthermore, one of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired CMOS device with desired source/drain regions. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

Therefore, it would have been within the scope of one of ordinary skill in the art to combine the teachings of Bevk and Liaw to enable the disclosed source/drain regions of

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the CMOS of Bevk according to the teachings of Liaw because one of ordinary skill in the art would have been motivated to look to analogous art teaching alternative suitable or useful source/drain regions in Bevk and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

In reference to claim 42, the combined teachings of Bevk and Liaw teach wherein said co-doped germanium buried layer includes a p-type dopant (Bevk, column 4, lines 5 – 19).

In reference to claim 43, the combined teachings of Bevk and Liaw teach wherein said p-type dopant is boron (Bevk, column 4, lines 5 – 19).

In reference to claim 44, the combined teachings of Bevk and Liaw teach wherein said co-doped germanium buried layer should have a mole fraction of at least 0.1 and wherein the germanium concentration determines a level of strain and critical thickness (Bevk, column 2, lines 50 – 64), but fails to disclose wherein said co-doped germanium buried layer has a germanium concentration ranging from about 1×10^{20} atoms/cm³ to about 7×10^{20} atoms/cm³.

However, the selection of the claimed germanium concentration is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired germanium co-doped layer with a desired strain and thickness. In re Jones, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and In re Boesch, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). Therefore, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to enable using the combination of Bevk and Liaw to arrive at the claimed limitation using routinary experimentation.

In reference to claim 45, the combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fails to disclose wherein said co-doped germanium buried layer has a thickness ranging from about 1 μm to about 10 μm .

One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired buried layer. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

In reference to claim 46, the combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fail to expressly disclose wherein said doped substrate, said co-doped germanium buried layer, and said epitaxial layer collectively have a thickness ranging from about 2 μm to about 20 μm .

One of ordinary skill in the art would have been led to the recited dimensions through routine experimentation and optimization to obtain a desired substrate. Applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966). See also MPEP 2144.04(IV)(B).

In reference to claims 47 and 50 the combined teachings of Bevk and Liaw teach wherein the germanium layer has a graded germanium concentration, wherein said gradation is, for example, triangular grading or parabolic distribution (Bevk, column 2, line 65 – column 3, line 4), and wherein the dopant concentration of the dopant within said germanium layer is greater than in said substrate and said epitaxial layer (Bevk, column 4, lines 6 – 20), wherein a first portion of the germanium layer immediately next to the substrate is labeled first doped lattice matching layer, wherein a second portion immediately next to the doped epitaxial layer is labeled second doped lattice matching layer, wherein a third portion next to said first portion is labeled third doped lattice portion, and wherein a fourth portion next to said second portion is labeled fourth doped

lattice matching layer. Therefore, the combined teachings of Bevk and Liaw teach upon the claimed invention.

In reference to claim 48, the combined teachings of Bevk and Liaw teach wherein dopant concentrations of said first and second doped lattice matching layers are each less than a dopant concentration of said co-doped germanium buried layer (Bevk, Fig.6).

In reference to claim 49, the combined teachings of Bevk and Liaw teach wherein a dopant concentration of said doped substrate is less than said dopant concentration of said first doped lattice matching layer and a dopant concentration of said doped epitaxial layer is less than said dopant concentration of said second doped lattice matching layer (Bevk, Fig. 6).

In reference to claim 51, the combined teachings of Bevk and Liaw teach wherein a dopant concentration of said third doped lattice matching layer is more than said dopant concentration of said first doped lattice matching layer and a dopant concentration of said fourth doped lattice matching layer is more than said dopant concentration of said second doped lattice matching layer (Bevk, Fig.6).

In reference to claim 52, the combined teachings of Bevk and Liaw teach wherein said first and second doped lattice matching layers each include a dopant gradient wherein a dopant concentration of each of said dopant gradients is greater adjacent said co-doped germanium buried layer (Bevk, Fig.6).

8. Claim 53 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bevk ('391) in view of Liaw ('769) as applied to claims 40-52 above, and further in view of Ramadani et al. (U.S. 7,067,856 B2, hereinafter Ramadani).

The combined teachings of Bevk and Liaw substantially teach all aspects of the invention but fail to expressly disclose wherein said transistor structure further includes interconnects located within interlevel dielectric layers located over transistors, which connect the transistors to form an operational integrated circuit and additional active and passive devices.

However, it is well-known in the art directed to MOS devices that these devices further include interconnects and other active and passive devices located within interlevel dielectric layers located over the transistors, which connect the transistors to form an operational integrated circuit. Further support can be in Ramdani (Figs.7-11 and column 13, line 38 – column 16, line 21). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made that the device of the combination of Bevk and Liaw would also include the claimed limitations as is well-known or as supported by the teachings of Ramdani.

Response to Arguments

9. Applicant's arguments with respect to claims 41-53 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

10. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides

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applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.



Julio J. Maldonado
December 3, 2007

Julio J. Maldonado
Patent Examiner
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